Mathematical modelling of vector control as a complementary intervention for onchocerciasis elimination

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“Vector control is a complementary tool to accelerate elimination of Onchocerciasis and can even become a key tool in Onchocerciasis endemic areas where Ivermectin cannot be safely used.”

-WHO/APOC (2015)
Report of the consultative meetings on: Strategic Options and Alternative Treatment Strategies for Accelerating Onchocerciasis Elimination in Africa
Key questions

➔ How **frequently** should larviciding take place to reduce the biting rate by a specified amount?

➔ For **how long** should larviciding be applied?

➔ What is the impact of initial (pre-control) **biting rate**?

➔ What is the impact of **larvicide efficacy**?
Savannah: *Simulium damnosum* s.l.
Forest: *Simulium squamosum B*
Measures of successful vector control

Bites per person per day vs. Time

1) Re-population time
Measures of successful vector control

2) Proportion of bites averted
Measures of successful vector control

- Bites per person per day

Time

3) Proportion reduction in DBR
Sensitivity of model output to changes in efficacy

Sensitivity of model output to changes in pre-control DBR

93% efficacy

80% efficacy
In summary

• We developed a model to consider the impact of vector control on blackfly population dynamics and biting rates.
• Larval efficacy strongly affects the reduction in daily biting rate, and measures to improve the efficacy should be prioritised.
• Reducing the interval between larviciding applications is more important in averting bites than carrying out more applications, however the converse is true when aiming to maximise the time to repopulation.
• Contexts with lower temperatures and/or where blackflies have longer gonotrophic cycles are also likely to be more successful candidates.
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